

## **Encouraging Commercial Development of New Techniques for the Real-Time Characterization of PM<sub>2.5</sub> Mass and Composition**

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A major scientific problem for the U.S. Environmental Protection Agency (U.S. EPA) at the present time is the identification of the link between exposure to atmospheric particulate matter (PM) and the development of cardiovascular morbidity and mortality effects in exposed populations. While a clear epidemiological link for this effect has been established, the etiology responsible for the observed effects is not now known. In particular, the sources, composition, and atmospheric pathways that maximize the undesirable human response are not known. As an aid to better understanding this etiology, the U.S. EPA is promoting the development and application of sampling techniques for the continuous determination of PM<sub>2.5</sub> mass and chemical composition. Such data will significantly improve our understanding of the primary sources, chemical conversion processes, and meteorological atmospheric processes that lead to the observed health effects. A major challenge is the development of techniques that accurately measure both the non-volatile and semi-volatile (nitrate and organic material) fraction of PM<sub>2.5</sub>.

The U.S. EPA and Brigham Young University have jointly conceived, developed, and demonstrated a research technique for the continuous measurement of the non-volatile and semi-volatile components of PM. We have also collaborated with industry in an effort to encourage private sector enterprises to develop, test, and commercialize new techniques for measurements that include semi-volatile as well as non-volatile PM. This research has led to the identification of a suite of instruments with great promise for meeting this objective with a significant reduction in the uncertainties associated with this complex and challenging scientific need. Collaboration with R&P Inc. (FDMS TEOM monitor) and GRIMM Technologies Inc. (PM Monitoring Station) has demonstrated that the indicated instruments accurately measure fine particulate mass, including the semi-volatile components. The Grimm instrument also provides continuous particle size distribution data. Collaboration with Sunset Laboratory (continuous elemental carbon/ organic carbon [EC/OC] monitor) and Dionex Inc. (IC-Based Gas and Particle Monitor) encouraged development and/or validation of new instruments that measure carbonaceous material and inorganic composition in PM, including the accurate monitoring of semi-volatile organic material and ammonium nitrate. As a result of the collaborative program, initiated and encouraged by the U.S. EPA, measurement tools are now commercially available for the continuous monitoring of mass and the determination of composition for both the non-volatile and semi-volatile components of PM<sub>2.5</sub>. Information on the field monitoring programs

conducted cooperatively with these companies and the suite of monitoring instruments resulting from this program will be presented.

**DISCLAIMER:** Although this work was reviewed by the U.S. EPA and approved for publication, it may not necessarily reflect official Agency policy.